

IN THE CLAIMS:

1 1. (CANCELLED)

1 2. (CURRENTLY AMENDED) The method of claim 1 wherein the step of generating
2 a super class comprises the step of:
3 saving class information associated with each class.

1 3. (CURRENTLY AMENDED) The method of claim 2 wherein the class informa-
2 tion includes for each class: A method for generating lookup tables and a final equiva-
3 lence set for use in classifying a network packet in accordance with a policy that specifies
4 one or more classes, each class containing one or more match statements, the match
5 statements being one of a stand-alone matching rule and a matching rule in an access
6 control list (ACL) defining one or more matching rules, the method comprising the steps
7 of:

8 generating a super class that contains all of the matching rules associated with the
9 classes specified by the policy and that contains for each class a class name that identifies
10 the class, a class criterion associated with the class, and a bitmap representing the
11 matching rules associated with the class;

12 converting the matching rules of the super class into a single, hierarchical ar-
13 rangement of lookup tables and associated equivalence sets, the hierarchical arrangement
14 having a plurality of levels including a first level and a final level, the final equivalence
15 set being associated with the final level.

1 4. (CURRENTLY AMENDED) The method of claim 1 wherein the network packet
2 is organized into a plurality of sections and the step of converting comprises the steps of:
3 A method for generating lookup tables and a final equivalence set for use in classifying a
4 network packet in accordance with a policy that specifies one or more classes, each class

5 containing one or more match statements, the match statements being one of a stand-
6 alone matching rule and a matching rule in an access control list (ACL) defining one or
7 more matching rules, the method comprising the steps of:
8 generating a super class that contains all of the matching rules associated with the
9 classes specified by the policy; and
10 converting the matching rules of the super class into a single, hierarchical ar-
11 rangement of lookup tables and associated equivalence sets, the hierarchical arrangement
12 having a plurality of levels including a first level and a final level;
13 generating a first-level lookup table and a first-level equivalence set for ~~each-a~~
14 network packet section using the matching rules of the super class;
15 merging the first-level equivalence sets to produce one or more next-level lookup
16 tables and next-level equivalence sets; and
17 merging the equivalence sets for each level to produce one or more next-level
18 lookup tables and next-level equivalence sets until ~~the-a~~ lookup table and equivalence set
19 associated with final level is produced.

1 5. (ORIGINAL) The method of claim 4 wherein each network packet section is associ-
2 ated with a value and the step of generating the first-level lookup tables and first-level
3 equivalence sets comprises the steps of:
4 creating a bitmap that represents the matching rules associated with a respective
5 network packet section's value;
6 determining if the bitmap matches an entry in the first-level equivalence set and,
7 if so, assigning an equivalence set index value associated with the matching entry to the
8 bitmap, otherwise, assigning a new equivalence set index value to the bitmap and placing
9 the bitmap in the equivalence set; and
10 associating the equivalence set index value with the first-level lookup table entry
11 associated with the respective network packet section's value.

1 6. (ORIGINAL) The method of claim 4 wherein the step of merging the equivalence sets
2 for each level to produce one or more next-level lookup tables and next-level equivalence
3 sets, comprises the steps of:

4 a) calculating the cross-product of a first bitmap associated with a first equivalence set and a second bitmap associated with a second equivalence set to produce a third bitmap;

7 b) determining if the third bitmap matches an entry in the next-level equivalence set and, if so, assigning an equivalence set index value associated with the matching entry to the third bitmap, otherwise, assigning a new equivalence set index value to the third bitmap and placing the third bitmap in the equivalence set;

11 c) associating a next-level lookup table entry with the equivalence set index value; and

13 d) repeating steps a through c for all entries in the first equivalence set and all the entries in the second equivalence set.

1 7. (CURRENTLY AMENDED) The method of claim 4 further comprising the step of:
2 associating each entry in the final equivalence set with one or more classes.

1 8. (CURRENTLY AMENDED) The method of claim 4 further comprising the step of:
2 transferring the lookup tables and final equivalence set to a network device that
3 performs packet classification.

1 9. (ORIGINAL) A method for generating lookup tables, a final equivalence set and a results table for use in classifying a network packet in accordance with one or more match statements, the match statements being one of a stand-alone matching rule and a matching rule in an access control list (ACL) defining one or more matching rules, the method comprising the steps of:

6 generating a super class that contains all of the matching rules;

7 converting the matching rules of the super class into a single, hierarchical ar-
8 angement of lookup tables and equivalence sets, the hierarchical arrangement having a
9 plurality of levels including a first level and a final level, the final equivalence set being
10 associated with the equivalence set of the final level; and

11 generating the results table from the entries in the final equivalence set.

1 10. (ORIGINAL) The method of claim 9 wherein each entry in the final equivalence set
2 is associated with an equivalence set index value and the step of generating the results
3 table from the entries in the final equivalence set, comprises the step of:

4 associating the equivalence set index value with a result associated with the
5 packet.

1 11. (ORIGINAL) The method of claim 9 further comprising the step of:

2 transferring the lookup tables and final equivalence set to a network device that
3 performs packet classification.

1 12. (CANCELLED)

1 13. (CANCELLED)

1 14. (ORIGINAL) A method for classifying a network packet in accordance with one
2 or more match statements, the match statements being one of a stand-alone matching rule
3 and a matching rule in an access control list (ACL) defining a plurality of matching rules,
4 the method comprising the steps of:

5 generating a super class that contains all of the matching rules;

6 converting the matching rules of the super class into a single, hierarchical ar-
7 angement of lookup tables, the hierarchical arrangement having a plurality of levels in-
8 cluding a first level and a final level, a final equivalence set being associated with the fi-
9 nal level;

10 generating a results table from entries in the final equivalence set;
11 applying the network packet to the lookup tables to generate an outcome index;
12 and
13 applying the outcome index to the results table to determine a result that applies to
14 the network packet.

1 15. (ORIGINAL) The method of claim 14 wherein the result is a pointer to a class
2 associated with the network packet.

1 16. (ORIGINAL) The method of claim 14 wherein the result is a pointer to a match-
2 ing rule associated with the network packet.

1 17. (ORIGINAL) The method of claim 14 further comprising the step of:
2 dividing the network packet into a plurality of sections.

1 18-22. (CANCELLED)

1 23. (ORIGINAL) A network device for classifying a network packet in accordance
2 with one or more match statements, the match statements being one of a stand-alone
3 matching rule and a matching rule in an access control list (ACL) defining a plurality of
4 matching rules, the network device comprising:

5 means for generating a super class that contains all of the matching rules;
6 means for converting the matching rules of the super class into a single, hierarchi-
7 cal arrangement of lookup tables and equivalence sets, the hierarchical arrangement hav-
8 ing a plurality of levels including a first level and a final level, a final equivalence set be-
9 ing associated with the final level;

10 means for generating a results table from entries in the final equivalence set;
11 means for applying the network packet to the lookup tables associated with the
12 first level to generate an outcome index; and

13 means for applying the outcome index to the results table to determine a result
14 that applies to the network packet.

1 24-27. (CANCELLED)

1 28. (CURRENTLY AMENDED) A method for generating lookup tables, the method
2 comprising the steps of:
3 generating a super class that contains a plurality of matching rules for sorting in-
4 coming packets into classes;
5 converting the plurality of matching rules of the super class into a single, hierar-
6 chical arrangement of lookup tables and equivalence sets; and
7 generating the-a final lookup table in response to the hierarchical arrangement of
8 lookup tables and equivalence sets.

1 29. (CURRENTLY AMENDED) The method of claim 28 further comprising the step of:
2 transferring the lookup tables and the final equivalence sets to a network device
3 that performs packet classification.

1 30. (CURRENTLY AMENDED) An apparatus for generating lookup tables, comprising:
2 means for generating a super class that contains a plurality of matching rules for
3 sorting incoming packets into classes;
4 means for converting the plurality of matching rules of the super class into a sin-
5 gle, hierarchical arrangement of lookup tables and equivalence sets; and
6 means for generating the-a final lookup table in response to the hierarchical ar-
7 rangement of lookup tables and equivalence sets.

1 31. (CURRENTLY AMENDED) The apparatus claim 30 further comprising:
2 means for transferring the lookup tables and the final equivalence sets to a net-
3 work device that performs packet classification.

- 1 32. (CURRENTLY AMENDED) A system for generating lookup tables, comprising:
- 2 a processor configured to generate a super class that contains a plurality of match-
- 3 ing rules for sorting incoming packets into classes;
- 4 the processor further configured to convert the plurality of matching rules of the
- 5 super class into a single, hierarchical arrangement of lookup tables and equivalence sets;
- 6 the processor further configured to generate ~~the-a final~~ lookup table in response to
- 7 the hierarchical arrangement of lookup tables and equivalence sets; and
- 8 a memory coupled to the processor, the memory configured to store the final
- 9 lookup table.
- 1 33. (CURRENTLY AMENDED) A computer readable media comprising:
- 2 the computer readable media containing computer executable instructions for
- 3 execution in a processor for the practice of generating lookup tables, comprising,
- 4 generating a super class that contains a plurality of matching rules for sorting in-
- 5 coming packets into classes;
- 6 converting the plurality of matching rules of the super class into a single, hierar-
- 7 chical arrangement of lookup tables and equivalence sets; and
- 8 generating ~~the-a final~~ lookup table in response to the hierarchical arrangement of
- 9 lookup tables and equivalence sets.
- 1 34. (NEW) An apparatus for generating lookup tables, a final equivalence set and a re-
- 2 sults table for use in classifying a network packet in accordance with one or more match
- 3 statements, the match statements being one of a stand-alone matching rule and a match-
- 4 ing rule in an access control list (ACL) defining a plurality of matching rules, compris-
- 5 ing:
- 6 a processor;
- 7 a memory coupled to the processor; and
- 8 means for generating a super class that contains all of the matching rules;

9 whereby the processor is configured to a) convert the matching rules of the super
10 class into a single, hierarchical arrangement of lookup tables and equivalence sets, the
11 hierarchical arrangement having a plurality of levels including a first level and a final
12 level, the final equivalence set being associated with the final level, b) place the lookup
13 tables and final equivalence set in the memory, and c) generate the results table from en-
14 tries in the final equivalence set.

1 35. (NEW) The apparatus of claim 34 further comprising:

2 a content-addressable memory (CAM);
3 whereby the processor is configured to place the lookup tables in the CAM.

1 36. (NEW) A computer readable media containing computer executable instructions for
2 execution in a processor for generating lookup tables, a final equivalence set and a results
3 table for use in classifying a network packet in accordance with one or more match
4 statements, the match statements being one of a stand-alone matching rule and a match-
5 ing rule in an access control list (ACL) defining one or more matching rules, the instruc-
6 tions adapted for:

7 generating a super class that contains all of the matching rules;
8 converting the matching rules of the super class into a single, hierarchical ar-
9 rangement of lookup tables and equivalence sets, the hierarchical arrangement having a
10 plurality of levels including a first level and a final level, the final equivalence set being
11 associated with the equivalence set of the final level; and
12 generating the results table from the entries in the final equivalence set.

1 37. (NEW) A computer readable media containing computer executable instructions for
2 execution in a processor for classifying a network packet in accordance with one or more
3 match statements, the match statements being one of a stand-alone matching rule and a
4 matching rule in an access control list (ACL) defining a plurality of matching rules, the
5 instructions adapted for:

6 generating a super class that contains all of the matching rules;
7 converting the matching rules of the super class into a single, hierarchical ar-
8 rangement of lookup tables, the hierarchical arrangement having a plurality of levels in-
9 cluding a first level and a final level, a final equivalence set being associated with the fi-
10 nal level;
11 generating a results table from entries in the final equivalence set;
12 applying the network packet to the lookup tables to generate an outcome index;
13 and
14 applying the outcome index to the results table to determine a result that applies to
15 the network packet.